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THE OPERATIVE RELIEF OF GANGRENE OF INTESTINE DUE TO OCCLUSION OF THE MESENTERIC VESSELS.

BY J. W. ELLIOT, M.D.,

OF BOSTON,

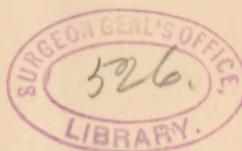
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THE OPERATIVE RELIEF OF GANGRENE OF
INTESTINE DUE TO OCCLUSION OF THE
MESENTERIC VESSELS.

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CASES of infarction and gangrene of the intestine due to thrombosis or embolism of the mesenteric vessels are not often seen even by the pathologist and have rarely been recognized during life. The subject is not mentioned in any modern text-book except Osler's. I have been unable to find even a suggestion that surgery might be useful in such cases. On the contrary, it is distinctly stated by certain authorities that such cases are beyond the help of surgery; and yet, by a strange chance, two such cases were operated on by me within three weeks.

CASE I.—*Resection of Four Feet of Intestine for Infarction probably due to Thrombosis of the Superior Mesenteric Veins.*—The patient, a man of twenty-five years, entered the Massachusetts General Hospital on July 10, 1894, at 7 P.M. He had had a right inguinal hernia of about the size of an egg for four years, for which he had worn a truss at times. Ten months before entrance the hernia had been caught in the ring and was returned by a physician with considerable difficulty and great pain. Since which time any sudden exertion had caused pain at the site of the rupture, but the hernia had never come down again. He had had pain in the right lower abdomen for the past two weeks. He felt well the day before entrance until the onset of slight pain in the right groin while playing ball. He went home and vomited, but thought that due to smoking. He slept all night and ate breakfast on the morning of the day of entrance to the Hos-

pital. His bowels moved naturally, and he felt well and began work as usual. An hour later he felt pain in the right inguinal region while carrying a box. The pain increasing, he went home and vomited. It became very severe in the right lower abdomen, and at 4 P.M. Dr. Vaughan, of Everett, was called and gave several doses of morphia, but found no evidence of hernia. The patient continued vomiting in the afternoon.

On entrance, at 7 P.M., his general condition was good. Pulse, 56; temperature, 99.8° F. He was well nourished, but pale. He complained of great pain over the whole of the lower abdomen, constant with acute exacerbations. An elongated bunch was felt over the appendix region. There was no distention or tympanites, and the inguinal ring was empty. He hiccupped through the night, but had no nausea or vomiting. The pain continued paroxysmal with intervals of almost entire comfort. It was thought best not to mask symptoms with morphia, and he had an exhausting night with little sleep. At 6 A.M. his pulse was 54, of good quality; a little later his lips grew very pale; at 9 A.M. he was evidently worse and looked badly, but pulse remained at 80. He failed rapidly. The operation was done at eleven o'clock, about twenty-four hours after the first severe pain, with the patient in poor condition, with pulse 140.

No diagnosis was made, but it seemed clear that the case was a very unusual one and a very urgent one. The abdomen was opened in the right linea semilunaris below the level of the umbilicus. On opening the peritoneum a large quantity of bloody fluid escaped. Lying beneath the incision was a knuckle of very dark, gangrenous-looking, small intestine. The inguinal ring was found empty and there was no evidence of inflammation about it. The dark knuckle of gut, consisting of several coils of the jejunum, was lifted out of the abdomen and the cause of the condition searched for. There was no evidence of hernia or any other constriction or of a twist. The intestine was neither dilated nor contracted at any point. The unhealthy portion was deep red and nearly black, having a slight gangrenous odor; its walls were thickened by the presence of dark blood in the tissue. The peritoneal coat was without lustre and so friable that it was easily torn by handling. It was divided from the healthy part by a wide, diffuse shading at both ends. There was no abnormal lengthening or shortening of its mesentery. It was evidently an haemorrhagic infarction almost gangrenous. There were enlarged glands in the mesentery, and the mesenteric vessels felt

thick and seemed to be plugged. Forty-eight inches of intestine were resected, care being taken that the section should be made in perfectly healthy tissue. It contained no faecal matter, but a quantity of the same bloody fluid that was found in the peritoneal cavity. The mesenteric vessels bled but little. Owing to the doubtful origin of the trouble and the poor condition of the patient, primary suture of the cut ends was not attempted. The mesenteric borders being carefully united, the open intestine was rapidly stitched into the abdominal wound.

The patient was put to bed in very poor condition, being dark-blue in color, with pulse of 160. But he rallied in a few hours. The next day the pulse remained shaky, but there was no vomiting nor abdominal distention. He took milk and lime-water. There was a discharge of foul-smelling black blood from the intestinal opening.

On the second day faecal matter passed from the artificial anus, and in the next few days he improved rapidly. The discharge from the opening in the bowel was of a greenish-yellow color and was very irritating.

In about two weeks after the operation it became evident that he was losing flesh. The discharge from the wound was more irritating and was actually digesting the skin in the region. This latter difficulty, however, was much improved by the use of a constant drip of salt-water over the wound. Under these circumstances it seemed best to close the opening in the bowel at once.

On July 27 I dissected the ends of the bowels free from the wound and stitched them together. The wound held well for a week when an irritating stitch was taken out; this was followed by a leaking out of a small quantity of intestinal fluid. A small fistula remained open at this point, but the patient was much relieved. He gained in flesh and strength and was up and about, controlling the discharge from the fistula with a water-truss. The patient was shown at the Surgical Society. On November 16 the fistula was closed by an intestinal resection. Recovery is complete, there being no impairment of nutrition.

The obscure point in this case is the cause of the plugging of the mesenteric vessels. In this connection we have to consider, on the one hand, the probabilities of the vessels being constricted by some outside pressure, such as a strangulation or twist might cause; and, on the other, their being plugged by

thrombosis or embolism. As to the former alternative there was not the slightest evidence of any condition which could cause such pressure. It is almost inconceivable that even a twist could exist long enough to cause sloughing and then become untwisted after the gut was swollen and oedematous, leaving no trace to be seen at an operation done twenty-four hours after the first symptoms. Besides, the symptoms were progressive, there being no intermission suggestive of a change for the better.

After a careful search I have been unable to find a single case of strangulation or twist where anything like this amount of blood was found either in the intestine or peritoneal cavity. As to the latter alternative, no source of an embolism has been found and no cause for thrombosis can be suggested. The patient is young, has no heart murmurs, no atheromatous condition of the arteries, and denies syphilis. The liver is normal in size. As it was possible at the operation to exclude the known causes for outside pressure, and as it is impossible, with the patient still living, to explore the vascular system, it seems highly probable that the vessels were occluded by a process originating within themselves. Just what that process is must be determined by an expert pathologist, and Dr. Whitney has given the matter his careful consideration.

Pathological Report, by Dr. W. F. Whitney.—The piece of intestine removed was of a livid red color, as was also the attached mesentery, to within about 1 centimetre of the cut ends, where it was paler in color. The thickness of the walls of the intestine, as well of the mesentery, was greatly increased. Measuring in the former 6 millimetres and in the latter 12 millimetres, against a normal thickness of 2.5 millimetres and 2 millimetres respectively. This increase was due to extravasation of blood into the coats of the intestine and in the tissues of the mesentery. The vessels were everywhere distended with dark-red clots.

Upon opening the intestine it was seen crossed by transverse folds (*valvulae conniventes*) throughout its entire length, and contained a moderate amount of dark-red, grumous material.

Microscopic examination showed the veins and arteries both of the intestine and the mesentery filled with blood clots more or less

adherent to the walls of the vessels. As a rule, the blood-corpuses in the arterial clots were better preserved than those in the veins, and the clots themselves looser and not so intimately connected with the walls. Red blood-corpuses were everywhere to be seen lying densely packed together throughout the tissues, following the connective-tissue bands, separating the bundles of muscular fibres, and filling the lymph-vessels. In the relatively normal parts at the ends, the connective-tissue spaces were simply distended by fluid (œdema).

Although not so readily detected on account of the blood and its coloring matter, the nuclei of the cells of the intestine stained well, and there was but very little desquamation of the epithelium from the lining of the intestine.

No change could be detected in the walls of the arteries. But in the veins there was an indistinctiveness in the staining of the muscular coat, and some of the smallest radicles in the folds of mucous membrane were filled with large mononucleated cells suggesting their origin from the endothelium. Surrounding many of the smaller veins was a round-cell infiltration. An occasional small lymph-follicle was seen in the submucosa.

Remarks by Dr. Whitney.—From the examination it is evident the piece of intestine removed was a portion of the jejunum, in an extreme degree of hæmorrhagic infarction, with possible necrosis. The cause is probably thrombosis of the mesenteric veins. The reason for this conclusion will be apparent after a consideration of the conditions which bring about infarction of the intestine.

As is well known, in the first place, from the classical experiments of Litten, it can be brought about by closure of the superior mesenteric artery or one of its large branches. It takes place in from twelve to fourteen hours after the vessel is tied. But the back pressure from the veins, although sufficient to suffuse the tissues with blood through the altered capillary walls, is not sufficient to drive the blood back into the artery.

This is borne out by the condition I have found in two cases of thrombosis of that artery. In both of these the vessel was empty beyond the plug, although the intestine was of a dark, purple color and saturated with blood. In this specimen the arteries are filled as well as the veins, and suggests that there was

no hinderance to the entrance of the blood, but that its escape was interfered with.

As I have never had a case of thrombosis of the vein for direct comparison with this, as they are quite rare, reliance will have to be placed on the published description of such cases.

Orth¹ says that the most striking examples of hæmorrhagic infarction of the intestine are to be met with after stoppage of the vein. But he gives no detailed description.

The best accounts are those given by English and French observers, of whom the most recent is Pilliet,² who reports two cases of his own, and six of others. One of his descriptions is as follows :

At the autopsy of a woman, aged seventy-two, who died twelve hours after seizure with severe abdominal pain, etc., the intestines were found markedly distended. A portion of the small intestine consisting of two coils was in marked contrast to the rest by its deep red color. It was moderately dilated and covered with fine flakes of false membrane. Nowhere else was there any trace of peritonitis. The length of this piece was about forty centimetres. The mesentery formed a thick, black, apoplectic cake, twenty millimetres thick.

On section there was seen dilated veins filled with red, partly fibrinous clots, adherent to the walls. Microscopically all the layers of the mesentery as well as the coats of the intestines were infiltrated with blood-corpuscles crowded together. The appearances in the other cases are very similar.

Still more striking is the account given by Fagge.³

It was in the case of a woman, who died a month after delivery in a few hours after the onset of severe abdominal symptoms. The small intestine was an intense purple black color in marked contrast to the rest of the bowel, which was paler than normal. Congested parts limited above and below by a well-defined line, from four inches below the duodenum and terminated about the middle of the small

¹ Lehrbuch de Spec. Pathol. Anat., S. 773.

² See Progrès Médicale, 2, O. T. xi, p. 497.

³ Transactions Pathological Society, London, 1876, Vol. xxvii, p. 124.

intestine. The congestion extended a little way into the mesentery. The intestine felt massive and on section its coats appeared œdematos. The internal surface was reddened and covered with shreds of mucous, as if the membrane were being detached. It contained a thin, reddish fluid like that vomited.

Thrombi in the superior mesenteric veins extending into the trunk of the vena porta nearly to the point where it breaks up into its branches. The thrombosis extended into the veins beyond the territory that was congested. At the upper part the thrombus was softened and adherent to the wall of the vein. But within the mesentery the rootlets of the vein were distended to an extreme degree by a clot, which was perfectly solid there and evidently of more recent origin. The femoral veins were plugged with softened thrombi extending high up in the vena cava.

There was no endocarditis, or any evidence of peritonitis, or any cause for internal strangulation found.

The seat of the lesion in all the cases is reported as being in the small intestine, without, however, accurately locating it. The length of gut involved varies from forty millimetres to 100 centimetres in the French cases, and in Fagge's case must have been several feet.

The associated conditions which have been assigned in the recorded cases are marasmus, cirrhosis of the liver, and thrombo-phlebitis. In Pilliet's two cases he was unable to find any cause, and regards it as originating in bacterial inflammation of the intestine, which started the thrombosis of the veins. His evidence in support of this is, however, not very strong.

In Dr. Elliot's case the possibility of an axial twist of the intestines cannot be denied as a predisposing factor for the thrombosis. But there is not the slightest evidence either at the time of the operation or in the specimen that such a condition had ever taken place. The other associated conditions seem also to have been excluded here, and we are forced, as far as the evidence goes, to the assumption of a primary thrombosis of the mesenteric vein as the cause of the infarction.

CASE II.—*Thrombosis of the Mesenteric Artery; Enterotomy; Death.* Reported by Dr. Elliot.—The patient was a man nearly sev-

enty years old, who was sent to the hospital, June 21, 1894, from the Eye and Ear Infirmary, where he had just been operated on for a cataract. He had had rheumatic fever when a boy. About six months previous to entrance both legs had suddenly become paralyzed and he had only recently recovered their use. Three days before entrance he began to feel a dull pain in the epigastrium which gradually became more intense. At the time of entrance the pain came in severe paroxysms. The bowels had moved on the day he entered the hospital. On examination the abdomen was found distended and the transverse colon could be distinguished. The arteries were atheromatous.

On June 22 there was much nausea but no vomiting. Efforts to move his bowels resulted in three or four small liquid dejections containing blood but very little faecal matter. He continued to suffer severe pain, and the abdomen became more distended. On testing the capacity of the bowel by an enema, it was found to hold about a pint of warm water. The case was supposed to be an obstruction of the intestine (probably cancerous) in the descending colon.

On June 23 the abdomen was opened by an incision in the left linea semilunaris just over the distended colon. Free gas and faecal fluid was found in the peritoneal cavity. The transverse colon was distended and dark in color. The condition of the bowel excited my suspicion that it was not an ordinary intestinal obstruction, but the feeble condition of the patient prevented more extended exploration. The descending colon was opened and stitched into the abdominal wound. The gut was so friable that the stitches cut out, and it was finally held in place by a rubber plate passed into the bowel and pulled tightly up against the abdominal wall. A second abdominal opening was made in the median line through which the peritoneal cavity was washed out, and a glass drain was placed in the pelvis.

The patient was much relieved by the operation and looked well for a few days, but soon failed, and died at the end of a week. At the autopsy no obstruction of the intestine was present, but it was found that three or four inches of the descending colon had become gangrenous and perforated and had caused a general purulent peritonitis.

The gangrenous part of the intestine was examined by Dr. Whitney, and found to have been caused by thrombosis of a branch of the mesenteric artery.

Pathological Report, by Dr. Whitney.—The specimen consisted of a short piece of intestine of a dirty black color, and evidently

somewhat decomposed. The mesentery attached to this was not markedly thickened or infiltrated.

On examination of the vessels a branch of the artery was detected, about five millimetres of which were found reduced in size, and the lumen evidently occluded. The artery behind and in front of this place was empty. Unfortunately, no microscopic examination was made of the intestine.

The microscopic examination of the artery showed the lumen filled by a partly red and partly fibrinous thrombus intimately adherent to the wall of the vessel. The stoppage was not absolutely complete, as at one place there seemed to be a little channel, but there was no evidence of any fresh blood there. The walls of the artery were in general thick, and of the coats the greatest change was in the intima, which was many times above its normal thickness.

The plug was in the trunk of the vessel, not at any bifurcation, nor was any part of it distinctly different from the rest, as would be expected in the case of an embolus. It is therefore to be regarded as a primary thrombosis of the mesenteric artery, to which the thickening of the intima—chronic endarteritis—stands in a causal relation.

Remarks by Dr. Elliot.—Although occlusion of the mesenteric vessels usually causes infarction of the intestine, yet in two of the cases observed by Virchow the mesenteric artery was found obliterated and transformed into a cord without causing any change in the intestine. Tiedemann also mentions a similar case, but he notes the fact that the anastomotic branches were much enlarged. Such a condition is explained by supposing that the obliteration of the artery took place slowly, thus allowing time for the collateral circulation to develop. Litton¹ emphasizes the fact that the occlusion must take place suddenly to cause an infarction.

Autopsies show a wide variation in the extent and character of the intestinal lesions; in certain cases the intestine is black and gangrenous, while in others it is ulcerated or simply congested. Councilman² has lately reported a very important case where partial occlusion of the artery in a weak person caused a

¹ Virchow's Archiv, 63, 1875.

² Boston Medical and Surgical Journal, April 26, 1894.

complete paralysis and consequent distention of the intestine. There were ecchymoses, but no infarction. He remarks that probably sufficient blood-supply remained to preserve the integrity of the vessels, but not enough to provide the necessary enervation. In short, the result of occlusion cannot be definitely predicted, as the allied conditions are subject to such wide variations.

Symptoms.—I have found about 50 reported cases, where the artery was occluded. It should first be stated that in most of these cases there was evidence of heart-disease or atheromatous arteries. Dr. Moyes¹ found the source of the embolus in the left heart in 19 out of 23 cases. In analyzing these cases in order to arrive at a more definite idea of the relative frequency of the local symptoms, it has been necessary to exclude many cases on account of incompleteness in the reports. I have also excluded all the cases where the symptoms of heart-disease have overshadowed the abdominal symptoms and cases where the patients became unconscious early in the disease from other than local causes.

After such exclusion I have tabulated 20 cases. Even these have insufficient data. The following is a list of the principal symptoms :

Number of cases	20
Pain	17
Colicky pain	6
Vomiting	13
Vomiting of blood	3
Bloody stools	13 } 16
Profuse haemorrhage from bowels	6
Obstruction of faeces, but passage of blood	3 } 6
No faeces or flatus passed	3 }
Diarrhoea	9
Abdominal distention	8
Subnormal temperature	3
Tumor in abdomen	3

These cases were rapidly fatal. It appears that pain, often colicky in character, was the most prominent symptom, and it is usually the first. It occurred in almost all of the cases. Vom-

¹ Glasgow Medical Journal, 1880, Vol. xiv.

iting was noted 13 times. The most notable symptom was the presence of blood in the stools, which was recorded in 13 cases. In 6 cases it was described as profuse. In one it was said to be "uncontrollable," in another the patient died of "internal haemorrhage." The stools were frequently described as consisting of tarry-like blood with a carrion odor. Intestinal haemorrhage occurs in most of the cases, for when death ensues before it appears in the stools it is usually found in the intestines at the autopsy. In fact, blood in the intestines and in the peritoneal cavity is a most natural result of infarction.

A tumor was noted in three cases. In one case it proved to be a collection of blood in the mesentery, in the other two it was the infarcted bowel.

Subnormal temperature and extreme pallor have been noted in several instances. These symptoms are undoubtedly due either to the haemorrhage or to peritoneal shock or peritonitis.

The passage of blood is the only distinguishing sign. A typical case may be represented by a patient having heart vegetations or atheromatous arteries, who, without previous digestive disturbance, suddenly develops acute abdominal symptoms with intestinal haemorrhage. In the cases where the haemorrhage does not occur, diarrhoea might be suggestive, but if neither blood nor faeces passed it would be almost impossible to distinguish this condition from an acute obstruction, as in the second case reported.

The symptoms may resemble very closely those of intussusception, for in both diseases there is often diarrhoea and intestinal haemorrhage, as well as pain and vomiting. In distinguishing these two diseases, the presence of heart-disease or any other source or result of embolism would be in favor of embolism of the mesenteric artery; whereas, intussusception is most common in young persons, 56 per cent. occurring under the age of ten. (Fitz.) Although haemorrhage is common in both, it is more apt to be profuse in the embolic cases. It has been recorded as the principal cause of death in both. Swollen and tympanitic abdomen is rare in the early stages of intussusception, and occurred in nearly half the cases of embolism. A tumor has more

often been found in intussusception, and when found its character would usually settle the diagnosis.

I have found 14 reported cases of thrombosis of the mesenteric veins. These cases were even more rapidly fatal than those just referred to, nearly all having died on the second or third day with symptoms of intestinal obstruction. The different local symptoms were present in about the same proportion of cases as in the table already given for occlusion of the artery. Diarrhoea, however, is not mentioned in a single case. Blood either vomited or passed in large quantities was noted in one-half the cases. One would expect more profuse bleeding from plugging of the vein than of the artery, because with the vein only occluded the artery would still continue pumping blood into the tissue. One case reported by Sir William Gull,¹ due to syphilis, recovered. The patient fell in collapse after a copious haemorrhage; a few days later he passed per rectum portions of a dozen or more valvulae conniventes. This is interesting in connection with the post-mortem report of Fagge's case, a part of which reads, "it seemed as though the mucous membrane itself was being detached." In two of the cases a volvulus was considered to be the result of a thrombosis. In five there was cirrhosis of the liver. Two were syphilitic.

Finally, acute abdominal symptoms with passages of blood, in a patient with cirrhosis of the liver or some other obstruction to the portal vein, would be very suggestive of thrombosis of the mesenteric veins.

The *prognosis* is very grave, but the cases of Virchow and Tiedemann, already referred to, show conclusively that the collateral circulation may become established in time to save the intestine. Dr. Moyes quotes a case related by Parenzki, where a patient was operated on for stricture of the bowel, and only at the autopsy was it discovered that the stricture was due to cicatrization from ulceration caused by embolism of a branch of the superior mesenteric. According to the same authority there are on record at least three cases of recovery, where occlusion of the main stem of the artery is supposed to have taken place.

¹ Guy's Hospital Report, 1883, xvii, 15.

Treatment.—In general, the heart's action should be stimulated, because the only hope of recovery is in establishing a collateral circulation. In the literature I have found only three cases which have been operated upon. All were done accidentally without a diagnosis, and all with a fatal result.

The first case was by Mr. McCarthy.¹

The patient had symptoms of intestinal obstruction. At the operation no obstruction was found, but the mesenteric vessels were filled with clots. The perforated bowel was stitched to the abdominal wound. Death in ten hours.

The second case was by Kendal Franks.²

A patient with varicose veins and an ulcer of the leg had symptoms of acute intestinal obstruction, violent pains, vomiting. Neither faeces nor flatus passed. At the operation volvulus of a coil of small intestine was found. This coil was gangrenous. Its mesentery was thick and oedematous with all the veins thrombosed. "They felt like cords running through the mesentery, and were evidently not the result of recent disease." Sixteen inches of gut were resected with immediate suture. Death in two days.

The autopsy was made by Dr. Bewley, a pathologist. Part of the bowel below the line of suture had become gangrenous. Not only were the veins throughout a large piece of the mesentery completely occluded by old blood clots, but the same condition existed in the portal vein. An old, firm blood clot was found extending through its whole length, and so filled as to leave only a minute channel beside it for the passage of the blood. He was unable to ascertain the cause or origin of this state of the veins, but in his opinion it was unquestionably the primary cause of the gangrene of the gut, the volvulus being secondary.

Aside from the surgical interest, this case is one of the few in which the veins and not the artery were found plugged. The intestinal lesion and consequent symptoms were the same as in the cases where the artery alone was occluded.

The condition of the intestine which the surgeon will meet varies, as we have seen, from that of gangrene to a condition of

¹ *Lancet*, 1890, p. 646.

² *Transactions Royal Academy of Medicine in Ireland*, Vol. xi, 1893, p. 8245.

simple congestion or paralysis with dilatation. Of course, resection is the only operation to be thought of in case gangrene is present. It is equally clear that enterotomy is indicated in cases of paralysis with dilatation. The cases between these two extremes should be treated by resection or enterotomy according as the appearance of the gut seems to indicate danger of degeneration or a good chance of recovery. In short, it is the same question which arises in every operation for strangulated hernia. Is the condition of the gut beyond repair? Prompt laparotomy should be done for the profuse haemorrhage, provided the diagnosis is moderately certain. In these resections care should be taken to go well outside the disease. As we have seen, failure to do so caused death in Franks's case.

As such a pathological condition may require extensive resection (as in the case here reported), let us consider for a moment the question of how much intestine can be resected without impairment of the general nutrition.

(1) The longest piece ever resected is two metres eight centimetres, by Kocher, for a railway injury. The ends were united by primary suture. The patient remained well with the exception of having a diarrhoea, which was easily started by any error in diet.

(2) Koeberle¹ resected two metres three centimetres for multiple strictures. He stitched the cut ends into the abdominal wound, which closed in six weeks. The patient did not show lack of nutrition.

(3) Kocher² resected 160 centimetres for strangulated hernia, primary suture. Patient died three years later of another disease.

(4) Schlange³ resected 135 centimetres for internal strangulation. The patient was in good health two years later.

(5) Braun⁴ resected 137 centimetres for umbilical hernia. Immediate suture. Patient died four months later of inanition.

In the case here reported, 124 centimetres were resected and it is the sixth longest successful resection ever done.

¹ Bull. de l'Acad. de Méd., 1881, No. 4.

² Correspond. Blatt f. schweize Aerzte, 1886, No. 5.

³ Berliner klinische Wochenschrift, 1892, Band XLVII.

⁴ Centralblatt für Chirurgie, 1885, No. 7.

From experiments on dogs, Senn concluded: "In all cases of extensive resection of the small intestines where the resected portion exceeded one-half of the length of this portion of the intestinal tract, where the animals survived the operation, marasmus followed as a constant result, although the animals consumed large quantities of food. In all these cases defective digestion and absorption could be directly attributed to a degree of shortening of the digestive canal incompatible with normal digestion and absorption." He further states that in dogs and cats the excision of more than one-third of the length of the small intestine is dangerous to life.

Grzebicky¹ found that animals after extensive intestinal resection always lose in weight at first, but gain later. After many experiments and an exhaustive discussion of the subject, he concludes that a resection of 286 centimetres in man is perfectly feasible.

There is no doubt that immediate suture of the cut ends is the best method, but the doubtful condition of the gut and the strength of the patient must be considered. In general, however, taking a few inches more of intestine adds very little to the danger, and little time is gained by sewing the gut to the abdominal wound.

IN CONCLUSION.

As occlusion of the mesenteric vessels is usually associated with heart-disease or atheromatous arteries or cirrhosis of the liver, we must not expect much from operative treatment. Nevertheless, patients with symptoms of intestinal obstruction cannot be left unrelieved. We have yet much to learn about thrombosis, and there are on record a few cases in which the origin of the process could not be satisfactorily explained, and in which there was no serious complication which would make an operation unfavorable. Pilliet's theory that a bacterial inflammation in the intestine may start a thrombus in the veins is the most encouraging suggestion we have met. Possibly more cases will appear with purely local lesions. If so, this condition seems to me to offer a chance for an occasional surgical success.

¹ Archiv für klinische Chirurgie, 1894, Heft 1, p. 34.

